Section 403. DRAINAGE STRUCTURES

403.01 Description. This work consists of adjusting, constructing, or temporarily lowering drainage structures. As directed by the Engineer, this work also includes cleaning existing drainage structures and leads.

Drainage structure refers to manholes, catch basins, leaching basins, inlets and drop inlets. Drainage structures are designated as follows.

A. **Drainage Structure.** Consists of a concrete footing, or precast sump, and the drainage structure. Used for access to new or existing sewers with diameters up to 48 inches.

B. **Precast Manhole Tee and Manhole Riser.** Used for access to new sewers with diameters of 42 inches and greater.

C. **Manhole Base, Type 1 or 2 and Manhole Riser.** Used for access to new or existing sewers with diameters 48 inches and greater. Manhole Base Type 1 may be substituted for precast manhole tees.

403.02 Materials. Materials shall meet the following requirements.

Manholes for sanitary sewers shall be cast-in-place or precast concrete construction. Steel plates for temporary lowering of drainage structures that span 72 inches or less shall be structural steel plate with a minimum thickness of ½ inch and shall cover the entire drainage structure with a minimum bearing surface of 12 inches. The Contractor shall submit structural calculations prepared by a professional engineer licensed in the State of Michigan, for approval, for plates that span greater than 72 inches. The HMA material used for patching during the temporary lowering operations shall be the leveling mix or as approved by the Engineer.

403.03 Construction.

A. **Constructing, Adjusting, and Temporary Lowering of Drainage Structures, Precast Manhole Tees, Manhole Bases, and Manhole Risers.**

1. **Excavation.** Excavate according to subsection 206.03.A.

2. **Concrete Construction.** Construct concrete portions of drainage structures according to subsection 706.03. Do not cast when the concrete temperature is above 90 °F.

3. **Placing Brick and Block Masonry.** Do not place masonry with mortar when the temperature is 36 °F or less. Remove and replace work damaged by frost. Apply a ½ inch thick plaster coat of mortar to the outer surface of all structures, and to the inner surface below the outlet flow line on all catch basins with traps or sumps. Place the first set of bricks or blocks on a full bed of mortar. Lay brick or block in courses with mortar joints ½ inch thick ± ⅛ inch and of a uniform thickness throughout the structure. Break joints by half the length of the brick or block on adjoining courses. Place courses level except where otherwise required. Strike and point joints so that the exposed surface is true and smooth. Rake joints and wet brick or block prior to placing the plaster coat. Allow the brick or block surface to dry sufficiently to provide for proper bonding of the plaster coat.

   Brick. Thoroughly wet all brick. Allow the brick surface to dry only sufficiently to prevent slipping on the mortar. Do not use broken or chipped brick on the faces of the structure. Provide a course made of headers a minimum of every seventh course. Make closures with brick lengths not less than the width of a whole brick.

4. **Precast Reinforced Concrete Units.** Construct precast reinforced concrete units according to the standard plan or as detailed on the plans. Seal the joints with mortar according to subsection 403.03.A.3 or upon approval of the Engineer, a butyl rubber sealant conforming to AASHTO M 198 may be used. Footings shall be poured-in-place or precast concrete. Support precast concrete footings on a 6-inch subbase of compacted granular material Class II.

5. **Steel Reinforcement.** Install steel reinforcement according to subsection 706.03.

6. **Inlet and Outlet Pipes.** Place and compact backfill around the manhole base or sump to provide proper bedding for inlet and outlet pipes. Extend inlets and outlets through the outside wall surface a sufficient length to allow for pipe connections. Carefully construct masonry around them and seal with mortar to prevent leakage. Wrap the connection with geotextile as detailed in the standard plan. Construct flow channels in manholes according to the standard plans.

7. **Backfilling.** Backfill according to subsection 401.03. F. Backfilling may be staged to follow the construction progress of the structure.

8. **Temporary Lowering of Drainage Structures.** Lower drainage structures before milling the pavement. Removal of pavement to lower the structure is included in Drainage Structure Cover, Adjust, Case 1.

   The Contractor shall record the location of the structure so that each cover can be later installed at its original location. Remove the existing frames and covers and match mark them for later identification and placement. Salvage and safely store the frames and covers. Repair the existing structure as needed to allow uniform contact of the steel plate to the top of the structure. The repairs are included in the work of adjusting

drainage structure covers. Place and compact the HMA mixture according to subsection 503.03.

B. **Drainage Structure Covers.** Furnish and install new covers, including frames and grates, on new or existing structures according to the standard plans or as detailed on the plans. Place castings on a full mortar bed.

C. **Adjusting Drainage Structure Covers.** Make final adjustment of drainage structures within the HMA pavement section immediately before placement of the top course or overlay if only one course is applied. Adjusting a cover applies when the elevation of the cover is changed up or down 6 inches or less. Adjust the cover to the required elevation by supporting it on a metal ring adjustor, on a concrete collar, or on masonry in a full mortar bed. Adjusted covers shall be held firmly in place. Remove and replace the adjacent pavement, curb, or curb and gutter to the existing grades or to the required elevations.

D. **Additional Depth of Adjusting Drainage Structures.** Applies when a drainage structure cover is adjusted more than 6 inches from the existing cover elevation due to a change in elevation of the roadway or when alterations to the drainage structure exceed 6 inches regardless of the change in cover elevation. Remove damaged or unsound portions of the structure, if required, and adjust to the required elevation.

E. **Drainage Structure Taps.** Connections to existing drainage structures owned by counties, municipalities, or drain commissions shall be according to the regulations of the owner and the contract documents and specifications. If a conflict exists between the owner's regulations and these specifications, the owner's requirements will take precedence.

When tapping an existing drainage structure, a minimum opening equal to the outside diameter of the inlet pipe plus 6 inches shall be cut into the receiving structure. A minimum 3 inch mortar layer shall be packed completely around the inlet pipe and struck smooth with the inner wall of the structure. An existing drainage structure damaged by the Contractor during the tapping operation shall be repaired or replaced at the Contractor’s expense. Tapping directly to a sewer or culvert shall be according to subsection 402.03.D.

F. **Cleanout.** All catch basins, manholes, leaching basins and inlets installed on the project shall be maintained and shall be free of silt, debris, and other foreign material at the time of final acceptance.

G. **Cleaning Existing Drainage Structures and Leads.** Cleaning drainage structures consists of cleaning existing drainage structures in the area of the project as directed. Cleaning leads consists of cleaning existing sewers between drainage structures. Hauling and disposing of the waste generated is included in each item.

The Engineer shall determine the actual condition and necessity for cleaning, prior to cleanout.

The downstream drainage structure nearest the trunk sewer shall be cleaned first and a temporary bulkhead placed in order that the trunk sewer not be infiltrated. Upstream drainage structures and leads may then be cleaned.

The Contractor shall clean the drainage structure(s) and/or lead(s) of sand, silt, and all debris. The Contractor shall prevent any of the sand, silt, or debris from going further into the leads.

The waste generated from the drainage structure or drainage structure lead clean out operation shall be disposed of using one of the following methods. If at any time the waste generated is suspected of being hazardous, the Engineer shall be notified. If material tests hazardous as defined by Part 111, of the Natural Resources and Environmental Act, Act 451, P.A. 1994, the Engineer shall be notified immediately. Payment for disposal of hazardous material shall be according to subsection 109.07.

1. **Disposal Alternate A.**

    a. **Solid Waste Phase.** The solid waste generated shall be disposed of at a Type II landfill. Solid is defined as having no releasable liquids. The landfill may require testing before accepting the waste. The Engineer shall be provided disposal documentation from the Type II landfill.

    b. **Liquid Waste Phase.**

        Option 1 - This waste may be evaporated; or

        Option 2 - This waste may be placed in a sanitary sewer system with the approval of the owner of the system. A copy of the owner's approval shall be provided to the Engineer; or

        Option 3 - Disposal of this waste may be by placement into a portable tank or container and allowing enough time to allow the sediment and suspended solids to settle out. After the settling has occurred, only the clear liquid phase may be discharged into a storm sewer, well above a receiving stream, creek, drain, etc. This option must be carefully monitored to ensure that contaminants or sediment are not placed back into the sewer system. The remaining solid/liquid phase is to be managed as a waste and disposed of using Disposal Alternate B or using Disposal Alternate A with Options 1 or 2.

2. **Disposal Alternate B.**

    The waste generated shall be transported and disposed of by a Licensed Liquid Waste Hauler in accordance with Part 121, Liquid Industrial Waste, of the Natural Resources and Environmental Protection Act, Act 451, P.A. 1994. The Engineer shall be provided a copy of the manifest.

    If at any time the material is suspected of being hazardous, the Engineer shall be notified.

403.04 Measurement and Payment.

Contract Item (Pay Item)	Pay Unit
Dr Structure, __ foot dia	Each
Dr Structure, Add Depth of, __foot dia, 8 feet to 15 feet	Foot
Dr Structure, Add Depth of, __ foot dia, more than 15 feet	Foot
Drop Inlet, Type __	Each
Mh, Precast Tee, Cl __ , __ inch	Each
Mh Base, __ inch, Type __	Each
Mh Riser	Foot
Dr Structure Cover	Pound
Dr Structure Cover, Adj, Case __	Each
Dr Structure, Adj, Add Depth	Foot
Dr Structure, Tap, __ inch	Each
Dr Structure, Temp Lowering	Each
Dr Structure, Cleaning	Each
Dr Structure Lead, Cleaning, __ inch	Foot

A. **Drainage (Dr) Structures Excluding Drop Inlets.** Measure depth of drainage structures, with the exception of drop inlets, vertically from the top of the masonry to the top of the concrete footing. Payment is based on this measured depth as follows.

1. **Dr Structure, __ foot dia**, of the diameter specified will include the concrete footing and up to 8 feet of drainage structure depth.

2. **Dr Structure, Add Depth, __ foot dia, 8 feet to 15 feet**, of the diameter specified, will include that portion of a drainage structure which is deeper than 8 feet but not deeper than 15 feet.

3. **Dr Structure, Add Depth, __ inch dia, greater than 15 feet**, of the diameter specified, will include that portion of a drainage structure which is deeper than 15 feet.

B. **Drop Inlets.** Drop inlets of the type specified will be measured as units regardless of depth. Pipe leading from the drop inlet to a sewer or catch basin will be paid for separately. Pipe from Drop Inlet, Type 1 will be paid as a sewer. Pipe from Drop Inlet, Type 2 will be paid as encased sewer. A sewer tap or drainage structure tap will be paid only when tapping the sewer or encased sewer into an existing drainage system.

Cleanout, temporary lowering and adjusting of new drainage structures due to the Contractor's construction schedule are included in payment for new structures.

C. **Manhole (Mh) Base and Riser**. The riser above the collar of the **Mh, Precast Tee** will be measured as **Mh Riser.**

The riser above the **Mh Base** will be measured as **Mh Riser.** Payment for **Mh Base, Type 1** includes cutting the access hole into the sewer. Where a **Mh Base, Type 1** is used in place of **Precast Mh, Precast Tee** and the contract does not include the item **Mh Base, Type 1,** the work will be paid for as **Mh, Precast Tee.**

Measure **Mh Riser** vertically from the top of the manhole base or precast tee to the top of the riser, regardless of depth.

D. **Drainage Structure Covers**. Measure **Drainage Structure Cover** in pounds. Payment is according to the nominal weights in the following table.

Table 403-1 Nominal Weight of Drainage Structure Covers

Cover	B	C	CX	D	DX	E	G	J	
Weight, lbs	350	500	500	465	465	200	305	655	
Cover	K	L	M	Q	R	RX	W	V	VG
Weight, lbs	500	500	500	350	550	550	370	710	610

Placement of new covers on existing structures also requires payment for **Dr Structure Cover, Adj, Case __**.

Payment for **Dr Structure Cover, Adj, Case 1** includes sawcutting existing pavement, curb, and curb and gutter, where required, and adjusting the cover up or down, a maximum of 6 inches, to the required elevation. Removal and replacement of pavement adjacent to the adjusted cover is included in the item **Dr Structure Cover, Adj, Case 1.** Payment for removal and replacement of curb and gutter adjacent to the adjusted structure is not included in adjusting the structure and is paid for separately.

Dr Structure Cover, Adj, Case 2 only applies to structures located outside existing pavement, curb, and curb and gutter or within the existing pavement at locations where the pavement is shown to be removed in accordance with section 204.04. Repairs needed to allow uniform contact of temporary steel plate to top of structure is included in **Dr Structure Cover, Adj, Case __**.

Measure **Dr Structure, Adj, Add Depth** beginning 6 inches from the level of the existing structure (in the direction of adjustment) to the limit of the additional depth of adjustment. Payment for **Dr Structure, Adj, Add Depth** also requires payment for **Dr Structure Cover, Adj, Case __**. Drainage structure taps within the limits of the adjustment are included in payment for **Dr Structure, Adj, Add Depth**. **Dr Structure, Tap** will only be paid for the taps to existing drainage structures outside the limits of adjustment. Taps to existing Sewers are paid for as **Sewer Taps** according to subsection 402.04.

E. **Drainage Structure, Temporary Lowering.** Measure **Dr Structure, Temp Lowering** as units. Payment includes match marking; removing, salvaging, and transporting castings to and from site; storing the existing structure castings; plating the structure; and HMA patching. Removal of the plating and HMA patching materials at the time of final adjustment are included in this pay item. Final adjusting of the drainage structure is paid for separately.

F. **Cleaning Existing Drainage Structures and Leads**. Drainage structures to be cleaned shall be measured as units. **Dr Structure, Cleaning** includes all equipment and labor to clean each structure and hauling, testing if required for disposal, and disposing of all waste generated.

Dr Structure Lead, Cleaning, __ inch includes all equipment and labor to clean storm sewers and hauling, testing if required for disposal, and disposing of all waste. Placement and removal of temporary bulkheads are included in this item of work.

Clean-out of existing sewers plugged by the operation of the Contractor will not be paid for separately, but shall be considered as having been included in the unit prices bid for other contract items.